SCH4CR REVIEW OF PERIODIC TABLE AND INTRO TO BONDING WS-6

1. An element key on the periodic table may resemble something like what is shown in the margin. Based on the information shown, indicate what represents the following:

Oxygen
8
O
16.000

   a. *Atomic number* – 8
   b. *Average atomic mass* – 16.0u
   c. *Atomic symbol* – O
   d. *Element Name* – oxygen

2. Match the terms in Column II with the descriptions given in Column I.

	Column I	Column II
E	i. Usually gases or brittle solids at room temperature; poor conductors of heat/electricity	a. Noble gases
C	ii. Elements that have similar physical and chemical properties	b. Metalloid
B	iii. Have properties of both metals and non-metals	c. Group
H	iv. Row of elements in the periodic table	d. Metal
F	v. Section on the periodic table composed of groups 3-12	e. Non-metal
G	vi. Number of protons in the nucleus of an atom	f. Transition metals
D	vii. Element that has luster, is a good conductor of heat/electricity, malleable, solid at room temp.	g. Atomic number
I	viii. Group of elements that form cations with a +1 charge	h. Period
A	ix. Group of non-reactive elements	i. Alkali metals

3. Give an example of a third period metalloid — arsenic
4. Which halogen has the largest average atomic mass? — astatine
5. Name of group 16 element that is a gas at room temperature — oxygen
6. Which lanthanide has the fewest protons? — lanthanum
7. Which actinide is used in our nuclear reactors? — uranium
8. Which transition metal is a liquid at room temperature? — mercury
9. Which metalloid has 7 valence electrons? — astatine
10. Element 119 is yet to be discovered. It will be named Gregorium and will have the symbol Gg!! What are some of Gg's physical and chemical properties? *Sweet. It would be in group 1 and thus would be metallic in nature as well as being the most reactive metal. It would react to form compounds such as GgBr, Gg_2O, and Gg_3N. It would react with water to form hydrogen gas as well as GgOH, a base.*

11. Draw the Bohr atom for elements with atomic numbers 9, 11, 18, and 20. In doing so, make use of the element's period and group number.

12. a. What is a cation? What has to happen to the atom in order for a cation to be created? *A cation is a positively charged atom. In order for a cation to form, the atom must lose at least one electron.*
    b. What is meant by the term *ionization energy*? *Ionization energy refers to the amount of energy that must be added to the atom to cause one of its outermost electrons to leave the atom.*
    c. What is the trend in ionization energy as you move from left to right along a period? *As you move from left to right along a period, the ionization energy increases. This means that it becomes progressively harder to remove an electron.*
    d. Metals will readily lose electrons whereas non-metals will not. How does *ionization energy* support this fact? *Metallic elements exist on the left side of the periodic table where ionization energies are low. This means that it is easier to remove electrons from metals contrary to non-metals where their ionization energies are high.*
    e. How does the Bohr model of the atom support the pattern for increasing ionization energy as you move from left to right along a period? *If you draw out the Bohr atoms for sodium through to argon, you will see that each time an electron is added, it is added to the same orbit. In the meantime, the charge in the nucleus is getting greater. This means that the nucleus then will have a greater attraction for the outer electron as you move from left to right in the row.*
    d. What is the trend in ionization energy as you move down the *alkali metals*? *As you move down the column, the ionization energy decreases.*
    e. How might this explain the fact that francium is much more reactive than sodium? *These metals like to lose electrons as they react. Since it is easier to remove an electron from francium than it is from sodium (according to the ionization energies) then it would reason that francium would react faster.*
    f. Does Bohr's model of the atom support the pattern seen as you move down group I? *Yes. Opposite charges attract but, the farther they are away from one another, the less the force of attraction. The electron in francium is much farther away from the nucleus than the electron in sodium and thus it's attraction is less… It's ionization energy would thus be less. Some people may argue that the nucleus for francium is more positively charged than that of sodium – true but there are more electrons in the way between the nucleus and the outermost electron for francium and these electrons hide (shield) the effect of the more positive nucleus*

13. a. What is electron affinity? *Electron affinity is the opposite to ionization energy. It is the amount of energy released when an atom accepts (gains) an electron.*
    b. Which general class of elements have a greater affinity for electrons? *Non-metals have a greater affinity (desire) for electrons*
    c. What type of ion, cation or anion, are these elements most likely to form? *Anion*
    d. In terms of the Bohr atom, why would Fluorine have a greater affinity for electrons than say Iodine? *Fluorine's nucleus has a greater effective charge than that of iodine. With the outermost orbit being closer to the nucleus in fluorine, the nucleus is more effective at attracting the extra electron to it.*
    e. Why would Fluorine be more reactive than Iodine? *Both fluorine and iodine desire an extra electron; fluorine, having a higher electron affinity, is 'more desperate' for the electron.*

14. Give an example of an element which would form an ion with a:
    +1 charge? *Any element out of group 1* +2? *Any element out of group 2*
    +3? *Any element out of group 13* -3? *Any element out of group 13*
    -2? *Any element out of group 16* -1 charge? *Any element out of group 17*

Elements in group 18 are Unreactive and neutral. Bohr atoms for these elements show that they have an octet (8) electrons in the last orbit. *(Helium, which only has 2 valence electrons, has been placed in this group because it too is non-reactive).*

Chemists believe that it is this special arrangement of electrons in group 18 that gives the atom its stable, unreactive properties. This arrangement is often referred to as the stable octet.

With the information provided by ionization energy and electron affinity, as well as the way in which atoms combine in chemical reactions, chemists believe that it is the outermost electrons that play a key role in chemical reactions.

It is believed that, in reacting, the atoms are trying to obtain a stable octet (or at least the same electron arrangement as its nearest noble gas).

In order to simplify visualizing what is happening, instead of drawing Bohr atoms we draw Lewis dot symbols. *Lewis dot symbols concentrate solely on the valence electrons:*

1	2	13	14	15	16	17	18
H·							•He•
Li·	·Be·	·B·	·C·	·N·	·O·	:F:	:Ne:
Na·	·Mg·	·Al·	·Si·	·P·	·S·	:Cl:	:Ar:
K·	·Ca·	·Ga·	·Ge·	·As·	·Se·	:Br:	:Kr:

Remember that metals, in attaining the 'stable octet' have a tendency to LOSE ELECTRONS.

Non-metals, in attaining the 'stable octet' have a tendency to GAIN ELECTRONS.